



SPI 10 Years On - Torturing the Evidence

Joc Sanders

Sanders Enterprises

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martys@iol.ie





Sanders Enterprises

- Helping people work better
 - Training and consulting in software standards and formal software management processes
 - Providing management work packages which can be applied in your business
 - Training and consulting in the ‘soft’ issues that are so difficult for most technical people
- We specialise in creative software management to help you work smarter and accomplish more





1991 - a Key Year for Systematic SPI

Systematic SPI Approach	Publication in 1991
ISO 9001 for software	ISO 9001-3 Guidelines for Software <ul style="list-style-type: none">• Basis for TickIT
CMM (Humphrey at SEI)	CMM v1.0, Paulk et al <ul style="list-style-type: none">• First formal model of good practice
ISO 15504 (SPICE)	ImproveIT report to ISO/IEC JTC1/SC7 <ul style="list-style-type: none">• Origin of SPICE
Measurement based	

*2001 is a good year to review evidence
for success of these methods!*





Some Important Questions

- Is systematic SPI effective and economic?
- Always?
- In what circumstances?
- Is one SPI approach better than the others?
- How to choose between them?





Evidence that SPI Pays - CMM

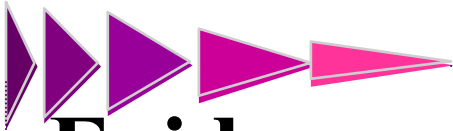
Category	Range	Median
Total yearly cost of SPI activities	\$49 000 - \$1 202 000	\$245 000
Years engaged in SPI	1-9	3.5
Cost of SPI per software engineer	\$490 - \$2 004	\$1 375
Productivity gain per year	9% - 67%	35%
Early detection gain per year (defects discovered pre-test)	6% - 25%	22%
Yearly reduction in time to market	15% - 23%	19%
Yearly reduction in post-release defect reports	10% - 94%	39%
Business value of investment in SPI (value returned on each dollar invested)	4.0 – 8.8	5.0

Source: CMU/SEI-94-TR13, Benefits of CMM-based SPI: Initial Results, Herbsleb et al

- *data from 13 organisations*
- *see www.sei.cmu.edu/*

Many other case studies have been published: see for instance Mark Paulk's Software CMM Case Study Bibliography www.sei.cmu.edu/activities/cmm/docs/roi/html





Evidence that SPI Pays - Measurement Based

Study

NASA GSFC SEL

Findings

- Cost down 58% in 5 years due mainly to reuse
- Error rates down by 35% in 10 years
- Improved ability to predict, control and manage cost and quality

Hewlett Packard

- 3X increase in productivity in 4 years
- 80% reduction in defect density
- prediction within 10% of actual

Phillips Sound & Vision

Motorola

- saved 10% of effort & reduced life cycle time
- 50X reduction in defect density over 3.5 years in 1 division
- significant cost reduction due to improved quality
- better ship-acceptance criteria and schedule estimation

Source: ISERN-97-12, Costs and benefits of SPI, El Emam & Briand

• summarising data in 4 published papers

• see <http://www.iese.fhg.de/>





Evidence that SPI Pays - Other

- **ISO9000 for software**
 - El Emam (op cit) points out that there is little data for specifically software organisations
 - Case studies of success do exist, but few ROI figures
 - TickIT
 - TRI-SPIN (www.cse.dcu.ie/cse/projects/trispin/trispin.html)
- **ISO15504 (SPICE)**
 - There is little data available about successful improvement using SPICE
 - This may be due to novelty, and the time for benefits to be realised
 - [SPIRE case studies and European Analysis Report \(www.cse.dcu.ie/spire/\)](http://www.cse.dcu.ie/spire/)
 - EU project funding 57 SSDs (<50 staff) to do short mentor-assisted SPI projects using SPICE
 - Some 40 case studies of successful improvement
 - European Analysis Report : >50% SSDs reported improvement objectives fully met or exceeded





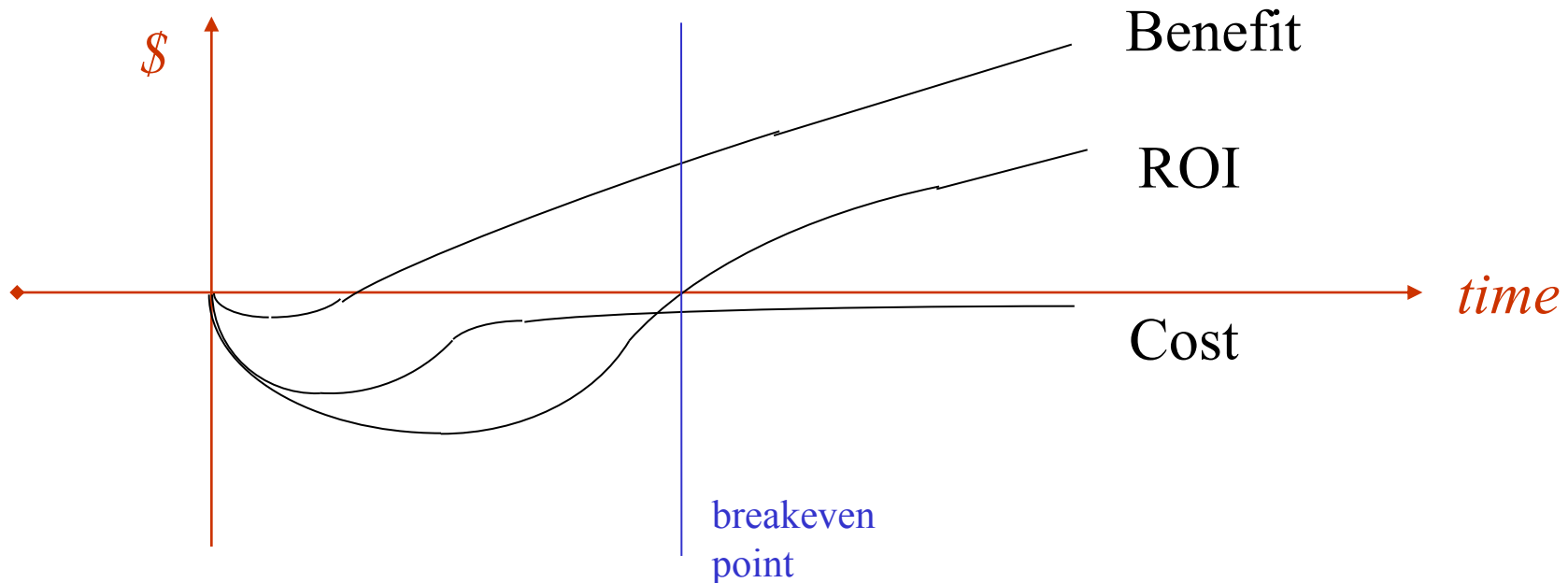
Evidence that SPI Pays - Other

- **EU ESSI funded Process Improvement Experiments**
 - Many case studies of successful process improvement using a variety of approaches in the [VASIE Repository \(www.esi.es/VASIE\)](http://www.esi.es/VASIE) and from the [SISSI project \(http://www.esi.es/ESSI/Reports/All/24151/Download.html\)](http://www.esi.es/ESSI/Reports/All/24151/Download.html)
 - *“ESSI has shown tangible evidence that SPI is not a risky and unsound fad but can pay off: in other words **it exists, it works, it pays**. However, the tangible evidence is that return is hardly measurable but remains at a qualitative level”*
 - [ESSI a Review of Current Results, Consolini & Fonade, 1997, http://www.cordis.lu/esprit/src/stessi.htm](http://www.cordis.lu/esprit/src/stessi.htm)



Problems with This Evidence

- How representative are the case studies?
- Benefits take time to be realised
 - So are only revealed by long term studies





SPI Is Not Always Successful!

Source: CMU/SEI-95-TR009, Goldenson & Herbsleb, After the Appraisal: a Systematic Survey of Process Improvement

- Survey of 138 individuals involved in 61 CMM appraisals in 92/93*
- www.sei.cmu.edu*

How successfully have appraisal findings and recommendations been addressed?

Little if any	14%
Limited	30%
Moderate	26%
Substantial	23%
Marked	8%





SPI Is Not Always Successful!

Statement	% Agree	
	CMM	SPICE
Nothing much has changed	26	72
There is a lot of disillusionment over lack of improvement	49	23
Improvement has been overtaken by events, crises etc	42	79

Sources:

- CMM: *CMU/SEI-95-TR009, Goldenson & Herbsleb op. cit. (www.sei.cmu.edu)*
- SPICE: *Interim Report on Phase 2 Trials, (www.esi.es)*

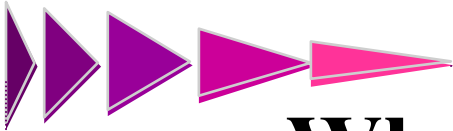




SPI Is Not Always Successful!

- ISO9000
 - My own experience with clusters of small companies:
 - Out of 10:
 - 2 or 3 drop out or achieve very little
 - 2 or 3 achieve a great deal
 - The rest make some progress
- SPIRE (using SPICE)
 - 16% of companies dropped out of programme for internal reasons (mostly resource/funding)
- Measurement Based
 - Research shows that many measurement programmes are abandoned





What Factors Affect SPI Success?

Organisational Factor

CMM SPICE

Senior management monitoring of SPI



Compensated SPI responsibilities



SPI goals clear & well understood



Technical staff involved in SPI



SPI people well respected



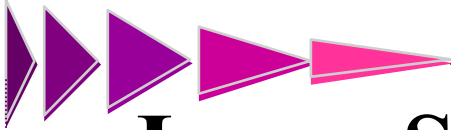
Staff time resources dedicated to SPI



Sources:

- CMM: *CMU/SEI-95-TR009, Goldenson & Herbsleb op. cit. (www.sei.cmu.edu)*
- SPICE: *Interim Report on Phase 2 Trials, (www.esi.es)*





Is one SPI approach better than the others?

- I have my own views, but they are based on very little evidence, because I can find very little!
 - It would seem that comparable data is very difficult to gather
- How we measure SPI success must depend on the specific organisation's business goals and needs
- The case studies show that all 4 approaches we have been discussing can be successful





How to choose between SPI Approaches?

- In the absence of hard data, make your choice based on your environment, your customers, your way of doing business
 - relevant case studies may help, if you can find them
 - be sceptical of the claims of those with special interests
- But do not delay - the evidence is clear that SPI has made a critical difference to very many software developers!





Answers to Some Important Questions

- Is systematic SPI effective and economic?
 - There is excellent evidence that SPI can yield large improvements in quality, cost & schedule, with a good RoI.
- Always?
 - No. A substantial proportion of SPI efforts fail.
- In what circumstances?
 - But the good news is that we have some evidence to help avoid failure.
- Is one SPI approach better than the others?
 - There is little evidence, but it clearly depends on circumstances.
- How to choose between them?
 - Pragmatically - *but don't delay if you want the benefits!*

